Title of the module | NMR: physical basics and biomedical applications
---|---
Term / semester | Summer term / 2
VAK-Number | Will be assigned centrally
Credit points | 6 ECTS
Compulsory / elective course | Elective course

<table>
<thead>
<tr>
<th>Teaching methods</th>
<th>Method</th>
<th>SWS</th>
<th>CP</th>
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</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>2 (28 h)</td>
<td>3.0</td>
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<tr>
<td>Seminar</td>
<td>1 (14 h)</td>
<td>1.8</td>
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<tr>
<td>Practical</td>
<td>1 (14 h)</td>
<td>1.2</td>
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<td>Course</td>
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<tr>
<th>Self studies</th>
<th>protocols</th>
<th>30 h</th>
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<tbody>
<tr>
<td>preparation of the talk</td>
<td>30 h</td>
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<tr>
<td>learning for the exam</td>
<td>40 h</td>
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<tr>
<th>Module representative</th>
<th>PD Dr. C. Neumann-Haefelin</th>
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<tr>
<td>Instructor</td>
<td>PD Dr. C. Neumann-Haefelin</td>
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<tr>
<td>Examiner</td>
<td>PD Dr. C. Neumann-Haefelin</td>
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Objectives
The module gives an introduction into the physical and mathematical basics of medical imaging and spectroscopy methods based on nuclear magnetic resonance (NMR). Additionally, some (patho-)physiological aspects of different diseases were discussed in order to identify possible markers to detect these disorders using NMR.

Content of teaching
Topics of the lecture:
- NMR-Equipment
- Principle of nuclear magnetic resonance
- Basics of signal- and image formation
- Relaxation
- Intrinsic and extrinsic NMR contrasts
- Basics of advanced NMR techniques (fast imaging, fMRI, …)
- Pathophysiological aspects of metabolic & cardiovascular diseases, diseases of the central nervous system
- Basic concepts of associated in-vivo models

Lab course:
Execution of NMR experiments to get a deeper understanding of the following NMR aspects and the ability to analyze / calculate NMR parameters
- NMR contrasts, Relaxation times, Diffusion …
- Relaxivity and contrast behavior of contrast agents
- Artefacts

Learning results
Fundamental and advanced knowledge in physical aspects of NMR imaging and spectroscopy including basics of the development of NMR methods and the analysis and understanding of detected images. Ability to develop / understand a strategy for in-vivo experiments based on given pathophysiology.

Control of learning progress
Oral participation, seminar talk, protocols and oral (or written) exam

Grading
Each 25%

Frequency
Every summer term

Use in other study courses
The module is also open for diploma students of biology (examination subjects: biochemistry, molecular and cell biology) and chemistry (main focus biochemistry).

Requirements
Successful participation in modules A and B

November 2014